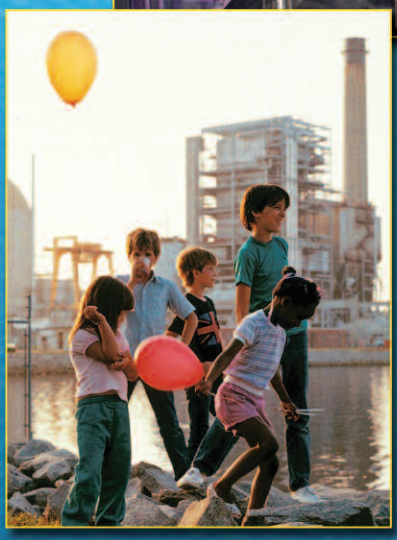
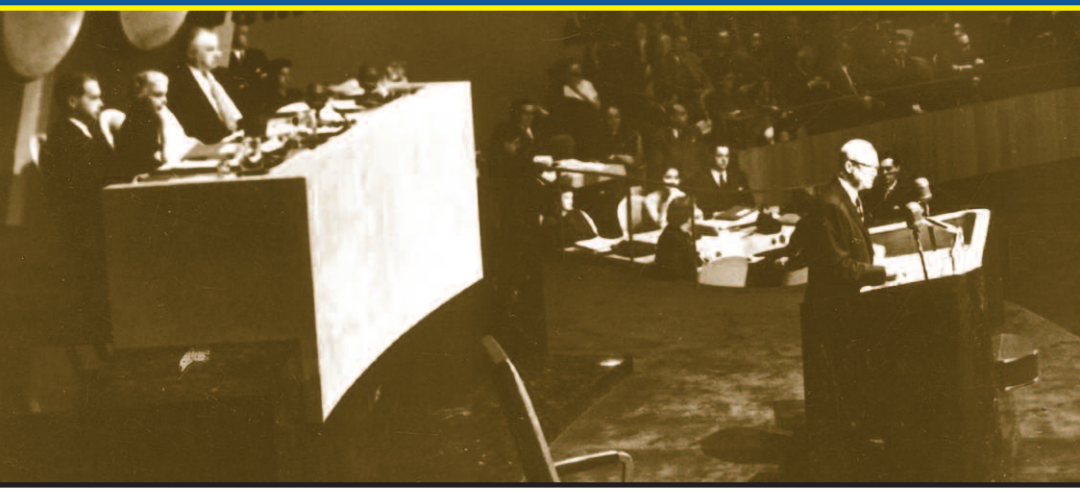
Atoms for Peace

In the 21st Century



"[to develop atomic energy] to serve the peaceful pursuits of mankind ... the needs rather than the fears of mankind."

President Dwight Eisenhower
Atoms for Peace address, December 8, 1953



➤ Atoms for Peace in the 21st Century
Building a Cleaner, Safer, More Prosperous World

The scientific challenge of unlocking the mysteries of the atom has always involved international collaboration. The world's most brilliant researchers made giant strides in their understanding of fundamental nuclear science throughout the 20th century by building on each others' pioneering work.

This brochure follows the path to progress, marking the success of our shared contributions. It highlights the programs that are important to the U.S. role in worldwide efforts to build a cleaner, safer, more prosperous world. No single nation can succeed alone. Only through a genuine global partnership, one that benefits our economies and the environment while limiting proliferation risks, will we realize the Atoms for Peace vision that the International Atomic Energy Agency (IAEA) was founded to pursue.

The U.S. and world scientific communities responded quickly to the Atoms for Peace challenge. By July 1955, researchers in Idaho recorded a significant achievement, when they powered an American town for the first time with electricity generated by nuclear power. A month later, scientists and policymakers from across the globe gathered in Geneva, Switzerland for the first United Nations International Conference on the Peaceful Uses of Atomic Energy.

Through the ensuing decades, a new nuclear era has delivered varied improvements to our lives. As we have become aware of today's industrial impact on future generations, nuclear technologies have allowed us to better monitor environmental impacts as well as mitigate them. The increased use of nuclear power will require regulatory programs assuring safety, security and protection of the environment. Joint conventions bring together 41 countries to establish high international standards for radioactive waste management.

Collaborative arrangements engage scientists in technical cooperation which demonstrate the benefits of peaceful nuclear technology in industry, medicine, science and infrastructure development. Agricultural and medical applications of nuclear science have limited disease and improved our health. Irradiation has provided new food preservation techniques. Researchers have investigated a technique called cell targeted

therapy that has been used to deliver radioactivity directly and selectively to cancer cell surfaces.

As we continue our international partnerships, hydrogen production, desalination and nuclear batteries present potential advances in nuclear technology.

➤ Building a cleaner world

NASA's image of the world at night, above, emphasizes the disparity of energy distribution. Megacities of more than ten million people exist in regions where the light density is scattered. Where population is dense, electricity provides for the services needed for sanitation, healthcare and other quality of life necessities. The expansion of nuclear power can improve lives and lead to beneficial uses of other nuclear technologies.

Scientists at Lawrence Livermore Laboratory found that the United Nations' Human Development Index reached a maximum value when electricity consumption rose to about 4,000 kilowatt-hours per person. That is well below consumption levels for most developed countries. Japan uses 8,000 kilowatt-hours per capita, the U.S. 13,000, Canada nearly 16,000.

Researchers estimate the threshold to be an annual consumption of 4,000 kilowatt/hours per person. The 4,000 kilowatt-hour threshold quantifies the minimum amount of energy needed to achieve the qualities of life attributed to developed countries. It also quantifies a much greater need for electricity worldwide.

By the turn of the 21st century, there were 103 nuclear plants fulfilling 20 percent of the United States' electricity demand and a total of more than 430 plants around the world, generating reliable baseload power, without producing greenhouse gases in the process.

At 20 percent of the total electricity supply in the U.S., nuclear power is the second largest source of electricity, while 70 percent comes from burning fossil fuels (coal, natural gas, and oil). Increasing the amount of electricity generated by nuclear power is critical to moving the nation toward a more sustainable and secure energy future.

The image above of fishing boats in the waters surrounding the Seabrook nuclear power station in New Hampshire highlights the use of nuclear generation for its positive environmental impact.

The world's nuclear power plant operations in 2005 offset more than two billion tons of carbon dioxide (CO_2) that comparable fossil-fueled plants would have generated. This is more than the CO_2 produced by every vehicle on the road in the U.S. every year.

Electricity demand will increase 75 percent over the next 20 years globally and 50 percent in the U.S. alone. While nuclear power is not the only answer, every plausible solution includes it. With more than 130 new nuclear plants under construction, planned or under consideration worldwide, many countries around the world are clearly moving forward with new nuclear plants.

In the U.S., we are nearing completion of the initial phase of preparations for a new generation of nuclear plants. Through the Nuclear Power 2010 program and incentives contained in the Energy Policy Act of 2005, government and industry are working together to effectively address regulatory and financial impediments that the first purchasers of new plants face. As a result, new orders are in the planning stages, with utilities announcing procurements of long-lead components.

The U.S. Nuclear Regulatory Commission recently noted that 16 power companies have announced their intention to apply for combined Construction and Operating Licenses for nearly 30 new plants. Joint government/industry cost-shared efforts will identify sites for new nuclear power plants, develop and bring to market advanced standardized nuclear power plant designs, and demonstrate streamlined regulatory processes.

We also seek to develop international fuel leasing arrangements to assure the availability of fuel and international partnerships to develop advanced recycling technologies. We have been working with other nuclear nations to build consensus on productive approaches, incentives and safeguards. To encourage countries to forgo fuel cycle activities, they must be assured of credible international fuel supplies, backed by designated supplies and governmental entities. These efforts backstop the proven performance of the well-functioning international commercial nuclear fuel sector.

➤ Building a safer world

The success of developing nuclear technology to benefit humanity comes with the responsibility of guarding its appropriate use. Peaceful uses of nuclear energy depend on regulation which helps secure, safeguard, and protect nuclear materials and technologies.

Safeguards are the basic building blocks of international nonproliferation programs. They include accounting for nuclear materials, control of technology, transparency in the use of technology and materials to validate peaceful uses, and the ability to inspect and verify compliance with international agreements and obligations.

International safeguards have been an effective deterrent against the spread of nuclear technology and materials. There are numerous examples.

- Radiation detection equipment installed at key transit points throughout the world – such as sea ports, airports, and land border crossings – is improving the international community's ability to detect movement of nuclear and radiological materials. The Megaports program helps border control personnel better assess radiological threats at ports of entry. Fifteen nations are implementing Megaports, and another 20 are considering it. Training for front-line enforcement officers worldwide is helping them interdict illicit technology transfers.
- Export control requirements support nonproliferation goals and help strengthen international control practices. The U.S. Nuclear Regulatory Commission issues the export licenses for the U.S. government for commercial use nuclear materials and sources.
- The U.S. participates in the International Code of Conduct for the Safety and Security of Radioactive Sources under which national safety and security controls are enhanced.
- The United States and the Russian Federation have agreed to halt their production of weapons-grade plutonium and have been cooperating for the last decade to permanently shut down plutonium production facilities.

- Through the U.S.-Russian “Megatons to Megawatts” program, more than 270 metric tons of highly enriched uranium (HEU) from dismantled Russian nuclear weapons has been downblended to low-enriched, non-weapons-grade material for use as fuel in commercial power reactors.
- Under the Global Threat Reduction Initiative, the international community is cooperating to identify, secure, recover and facilitate the final disposition of excess civilian nuclear and radiological materials.
- The international community is working to reduce and, where possible, eliminate HEU in civil nuclear applications by developing higher-density LEU fuels and targets for use in research reactors and by producing medical isotopes. Forty-three research reactors have converted from HEU to LEU fuel.

The United States is cooperating internationally to secure nuclear weapons and weapons-usable nuclear materials by upgrading security at nuclear sites; establishing the supplier practices, infrastructure, and export controls needed to control proliferation-sensitive commerce; and assisting partner nations to meet their safeguards commitments to the IAEA.

➤ Building a more prosperous world

The goals of the Global Nuclear Energy Partnership (GNEP) are ambitious… but are achievable with an invigorated international public-private partnership. A cooperative approach between industry and government, both in the U.S. and throughout the world, allows each sector to contribute what it does best – supporting research for continued innovation and commercializing technology for future growth.

GNEP’s goals include expanding use of nuclear power:

- Demonstrate more proliferation-resistant recycling that better secures sensitive materials and minimizes nuclear waste;
- Develop advanced burner reactors that will further mitigate wastes and enable a more efficient nuclear industry;
- Establish reliable fuel cycle services to guarantee fuel supplies globally;

- Demonstrate appropriately sized reactors that can be scaled to the individual nations' economies; and
- Develop enhanced nuclear safeguards to further secure and limit access to nuclear materials globally.

The U.S. Department of Energy invited industry worldwide to propose potential paths forward for fuel treatment and separation and for an advanced burner reactor. Government laboratories in the U.S. have been tasked with finding the best path forward for an Advanced Fuel Cycle Facility.

Public-private partnerships will be integral to increasing energy security throughout the world.

With an integrated strategy, commitment from key policymakers and a re-energized approach to public-private partnership, the path to a new era of peace and prosperity is envisioned and achievable through GNEP.

We continue on the path laid forth by President Dwight Eisenhower when he said, "The United States knows that peaceful power from atomic energy is no dream of the future. That capability, already proved, is here–now–today."

Building a Cleaner, Safer, more Prosperous World.

For more information,
please visit us online:
www.gnep.gov
www.ne.doe.gov